CHARACTERISTICS AND COMMON VULNERABILITIES INFRASTRUCTURE CATEGORY: HIGHER EDUCATION INSTITUTIONS

**Risk Management Division
Office of Infrastructure Protection
U.S. Department of Homeland Security**

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Preventing terrorism and reducing the nation's vulnerability to terrorist acts require understanding the common vulnerabilities of critical infrastructures, identifying site-specific vulnerabilities, understanding the types of terrorist activities that likely would be successful in exploiting those vulnerabilities, and taking preemptive and protective actions to mitigate vulnerabilities so that terrorists are no longer able to exploit them. This report is one of a series that characterize and discuss the common vulnerabilities of selected infrastructures. This report focuses on higher education institutions, both public and private, that provide academic instruction beyond high school. They include universities, colleges, technical institutes, and trade schools.

POTENTIAL THREATS

Figure 1 depicts the range of possible objectives for a terrorist attack on higher education institutions. Inflicting casualties in the form of fatalities, injuries, and illnesses is one of the major objectives of many terrorist acts. Casualties can occur both at a specific academic facility and in the surrounding area.

Damage or destruction of all or part of a higher education institution can be intended to shut down or degrade the operation of the entire institution, impede or destroy research efforts, or cause the release of hazardous materials to the surrounding area. Disruption of the institution without inflicting actual damage can be intended to interfere with academic studies and research projects. Theft of equipment, materials, or products can be intended to disrupt and sabotage research projects, divert these items to other uses, or reap financial gain from their resale. Theft of information can be intended to acquire insight that is not made public or to gain data that can be used in carrying out attacks. In the case of a major institution, it could have significant impact on the well-being of a large area, significantly affect national-level research and academic programs, and have widespread psychological impact.

Disruption of the institution can result in severe financial losses and erode the confidence of students, professors, and researchers in returning to the site. In addition, any significant terrorist attack at a higher education institution, especially an attack that inflicted numerous casualties,

would have a cascading effect. Concern over safety and fear that an attack could occur elsewhere might cause students and/or faculty to refrain from attending classes, engaging in research activities, or participating in events held at other higher education institutions. This would have a detrimental effect on academic studies, research activities in a variety of areas, and information exchange. People who are not students might also refrain from visiting these sites.
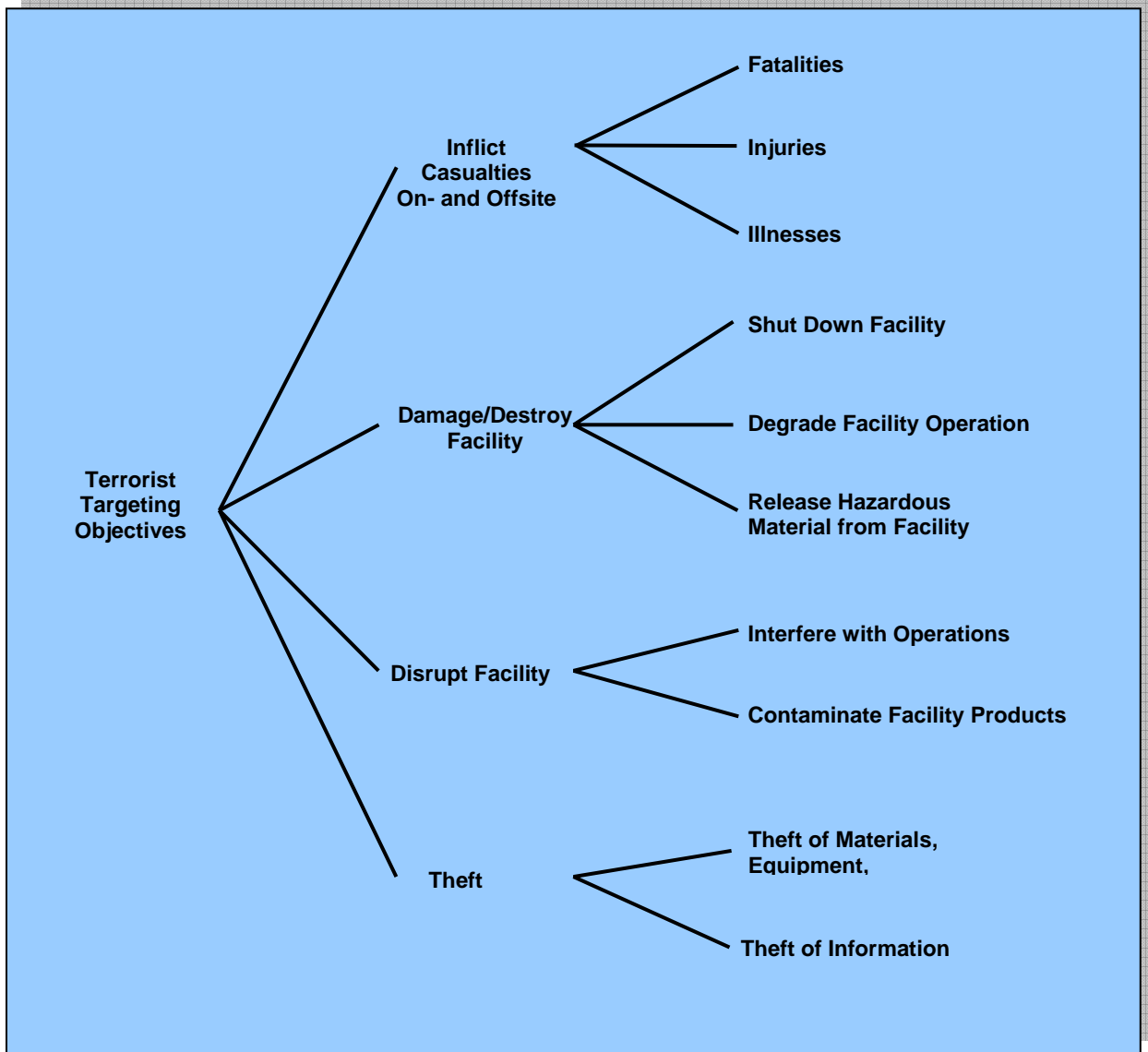

Figure 1 Potential Terrorist Targeting Objectives

Specific threats of concern to higher education institutions include:

- Explosives (e.g., car bomb, suicide bomber),

- Arson (e.g., firebombing, use of accelerants),

- Biological agents introduced into the facility (e.g., anthrax, botulism),

- Chemical agents introduced into the facility (e.g., chemical warfare agents, toxic industrial chemicals),

- Radiological material introduced into the facility,

- Hostage/barricade, and

- Automatic weapons/grenade attack (e.g., indiscriminate shooting of students and faculty).

CHARACTERISTICS OF HIGHER EDUCATION INSTITUTIONS

The following sections provide a summary description of the higher education institutions and some of the facility configurations that might be susceptible to threats.

Characterization of the Sector

The National Center for Education Statistics states:

> A postsecondary education institution is defined as an academic, vocational, technical, home study, business, professional, or other school, college or university, or other organization or person-offering educational credentials or offering instruction or educational services (primarily to persons who have completed or terminated their secondary education or who are beyond the age of compulsory school attendance) for attainment of educational, professional, or vocational objectives.

> Postsecondary, education institutions may be classified as either publicly or privately controlled; the privately controlled group includes two major categories: private nonprofit schools, and proprietary schools.

> Postsecondary education institutions may be grouped in the following manner, regardless of their source(s) of funding or their method(s) of delivering instruction:

> - Universities, colleges, and other educational institutions offering programs leading to bachelor's, master's, first-professional, and/or doctorate degrees;

- Community/junior colleges and other 2-year educational institutions offering programs leading to associate degrees, diplomas, certificates of completion, and/or their equivalents;

- Vocational-technical schools, technical institutes, business schools, flight schools, cosmetology/barber schools, trade schools, hospital schools, and other schools offering occupational training programs, frequently leading to diplomas or certificates; and

- Other training sources providing instruction in a program of postsecondary education, including local education agencies, business organizations, labor unions, professional organizations, religious organizations, museums, libraries, and individuals, but only when such education is offered to the general public.

A July 2002 report by the staff of Educause said that the higher education community in the United States comprised more than 11,000 higher education institutions, including 4,048 accredited, degree-granting 2-year (1,781) and 4-year (2,267) colleges and universities. Those 4,048 institutions collectively served 14.5 million students (both graduate and undergraduate), employed 3 million faculty and staff, and had combined budgets approaching $200 billion. Higher education institutions range in size from small institutions having fewer than 100 students and located in one building to large universities with tens of thousands of students and faculty occupying campuses the size of small towns or cities. They are located nationwide in every type of locale from large cities to suburbia to small towns to rural areas.

Many higher education institutions are well known worldwide. Others gain prominence for achievements and expertise in a variety of disciplines. A list of the most renowned institutions would include but not be limited to Harvard University and the Massachusetts Institute of Technology, Cambridge, MA; Yale University, New Haven, CT; Princeton University, Princeton, NJ; Johns Hopkins University, Baltimore, MD; University of Notre Dame, South Bend, IN; and Stanford University, Palo Alto, CA. In addition, the military service academies have symbolic meaning that would increase their attractiveness to potential adversaries. They include the U.S. Military Academy, West Point, NY; U.S. Naval Academy, Annapolis, MD; U.S. Air Force Academy, Colorado Springs, CO; U.S. Coast Guard Academy, New London, CT; and U.S. Merchant Marine Academy, Kings Point, NY.

A number of associations and organizations have a direct interest in security at post-secondary institutions. These include the International Association of Campus Law Enforcement Administrators; American Association of Community Colleges; American Association of State Colleges and Universities; American Council on Education; Association of American Universities; Association of Research Libraries; National Association of College and University Business Officers; National Association of Independent Colleges and Universities; National Association of State Universities and Land-Grant Colleges; and University Continuing Education Association.

Common Facility Characteristics

Most universities and colleges, except for the smallest, are located on a campus (Figure 2). Among the facilities found on a campus are libraries, lecture halls, laboratories, student residential areas, administration buildings, book stores, parking areas, auditoriums, gymnasiums, and cafeterias or other dining areas (Figures 3 and 4). Many campuses have park-like settings for students, faculty, and others to study or relax in (Figure 5). Large and mid-size campuses can have stadiums and arenas, small power plants, communication hubs, and other utility-type structures (Figures 6 and 7). Smaller higher education institutions may be located in a single building. In some cases, they are the sole occupant, while in other instances, they are a tenant in multipurpose buildings that house a variety of businesses and other organizations (Figure 8).

Figure 2 Aerial View of University Campus

Figure 3 Large University Lecture Hall/Classroom

Figure 4 Traditional University Laboratory

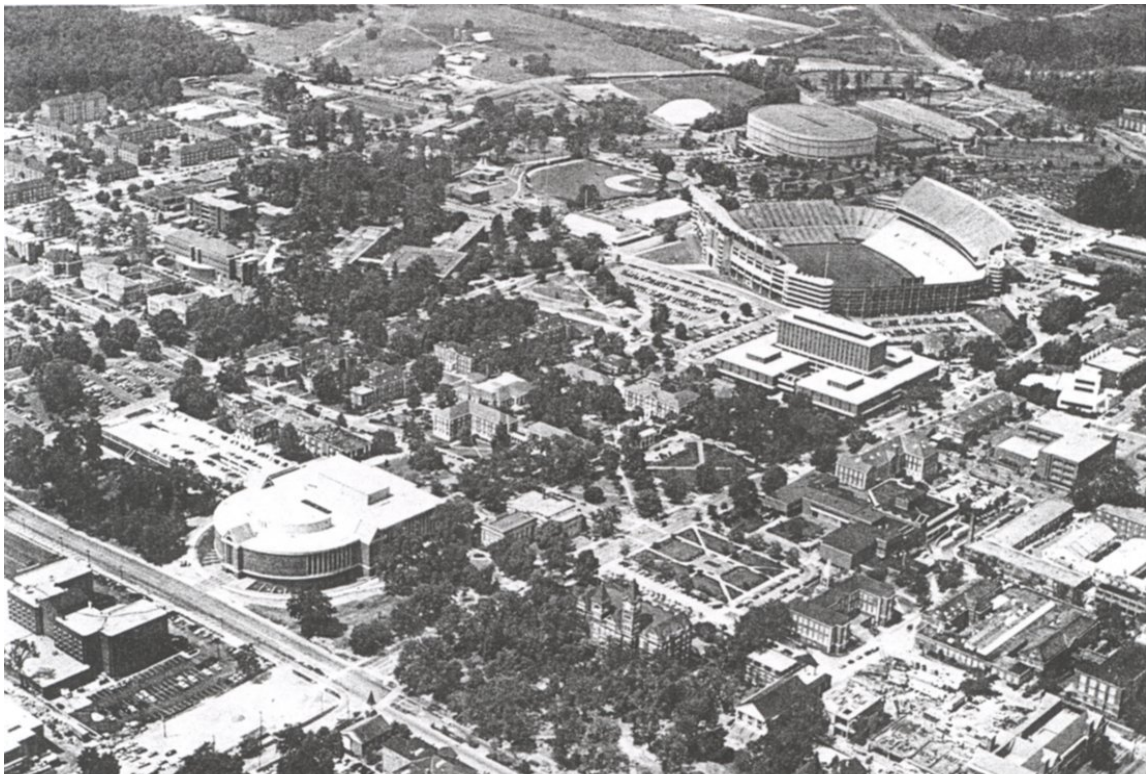**Figure 5 Aerial View of Community College Campus in Park-Like Setting**

Figure 6 Aerial View of Large University Campus

With the exception of stadiums and athletic fields, most higher education institution facilities are primarily enclosed buildings. Older universities have many buildings that have a classical and traditional look (Figure 9). They are often large, imposing structures. Facilities built more recently are "airy" and have incorporated modern architectural concepts, including the use of glass and bold artistic design (Figure 10). Because they occupy significant space and contain different facility mixtures, most campuses have unique configurations that depend on academic orientation, location (urban, rural, etc.) topography, and climate.

There is no uniformity in security at higher education institutions. Many university and college campuses do not have perimeter security or access controls. In fact, an open and inviting atmosphere is an integral part of the academic environment. Security measures or restrictions of any kind are usually accepted reluctantly. For the most part, they have been implemented to protect students and faculty against traditional criminal activities. While campuses are open, access to student dormitories and sometimes other buildings is restricted to residents, students, and faculty. Urban institutions in higher crime areas will generally have more stringent security than rural institutions.
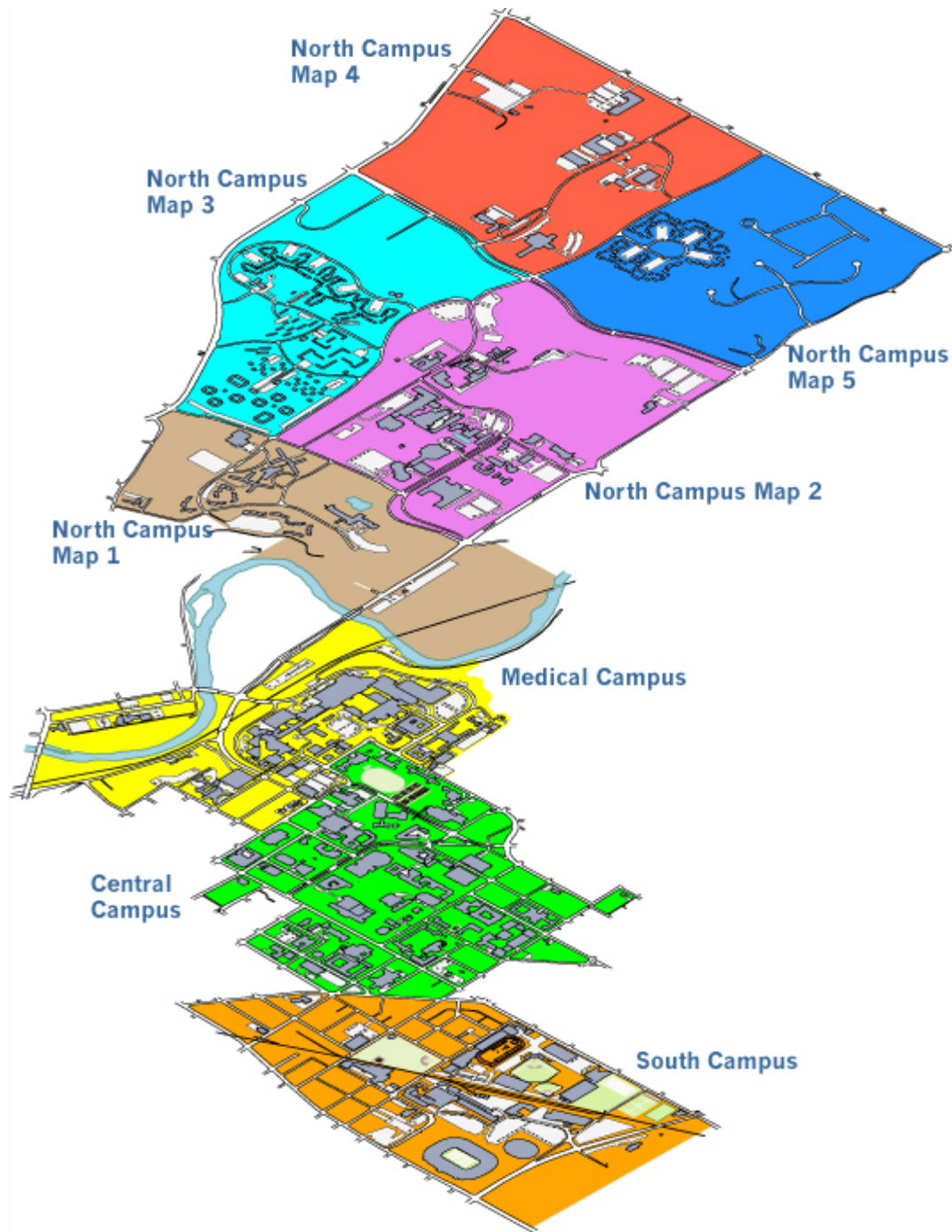
Figure 7 Campus Map/Configuration of Large University

Figure 8 Higher Education Institutions Located in a Single Building

Figure 9 Traditional Building on Major University Campus

A National Center for Education Statistics report reflects the disparate nature of campus security. It states:

> Campus security can be provided by many types of public safety employees. Security may be provided by sworn officers (i.e., officers with full arrest power) who are employees of the institution or who are employees of a state or local law enforcement agency (e.g., state police who are assigned to police duties on a public college campus). Security may also be provided by security officers or guards who are not sworn officers, by contract security (firms or individuals who

Figure 10 Building on University Campus with Modern Architectural Design

> are not employees of the institution who provide security under contract), or by other types of security personnel. Institutions may use just one type of public safety employee or different types to serve different security functions.

Some institutions, particularly smaller ones, rely on city and state police officers serving the campus as part of a larger patrol area.

Dedicated campus police and/or security forces control access to facilities where required, patrol buildings and grounds, and respond to incidents and emergencies. Traditionally, they have not been oriented toward responding to terrorist-type incidents. Their focus and major concern have been the protection of the university or college community from assault, rape, burglary, robbery, and other crimes against individuals and property-related crimes such as vandalism and theft. However, given recent terrorist incidents and the targeting of researchers by animal rights and environmental extremists, more campus security entities are engaging in contingency planning and putting more emphasis on dealing with a terrorist-type threat or incident.

Frequently, no security controls are placed on the content of vehicles entering post-secondary educational institution campuses or parking areas. Most institutions have restricted parking. In many cases, however, no access control restricts vehicles from accessing these areas (Figure 11). Instead, illegally parked vehicles may be ticketed or towed. At other parking lots where fees are collected, access may or may not be restricted (Figure 12). Parking lot attendants at these sites

are concerned with collecting fees and directing traffic. Most campuses with dedicated parking areas reserve some parking for visitors. Thus, a potential adversary could bring almost any type of weapon or explosive into the area.

Figure 11 University Parking Lot with Restricted Parking but without Access Control

Figure 12 University Parking Deck with Access Control

University and college stadiums and arenas are similar to their commercial counterparts, which are evaluated in a separate report on stadiums and arenas and are not discussed in detail in this document. University and college libraries are also covered in a separate document.

COMMON VULNERABILITIES

Key Vulnerabilities

The following is a list of the key common vulnerabilities of higher education institutions. In addition to these vulnerabilities, which are specific to higher education institutions, a number of general vulnerabilities that exist at many different infrastructure segments can be identified. These are listed in a later section.

- *Open access to people.* Most college and university campuses provide open access for students, faculty, and the general public. In general, there may be little or no control or inspection of people entering the campus and school buildings.

- *Access by vehicles.* While many schools restrict access to vehicles for parking control, there is generally no inspection or control of what may be contained in vehicles.

- *Building systems.* As with all enclosed buildings, and depending on specific system designs, school buildings are vulnerable to explosives; arson; chemical, biological, or radiological contaminants introduced into heating and cooling systems; blocked emergency exits; and similar building vulnerabilities.

- *Security for hazardous materials.* Schools engaged in research programs often have toxic, hazardous, biological, or radiological material on campus. The level of security for these materials can vary widely.

- *Security for sensitive information.* Some research efforts involve the gathering of sensitive information (e.g., on individuals or technologies). Physical and cyber security for this information may vary widely.

- *Large gatherings of people.* Many school events (e.g., athletic events, concerts, large lectures) result in the congregation of a large number of people. The level of security and screening at these events may range from none (e.g., for regular class lectures) to tight (e.g., for championship athletic competitions).

The American Association of State Colleges and Universities (AASCU), in a report entitled *Addressing the Challenge of Campus Security*, states:

> College and university campuses are essentially open environments; to many they are compelling symbols of democracy. This lack of environmental restraint and American symbolism make institutions of higher education valued targets. Campuses are easily accessible and convenient places for terrorists to hide

because they can blend in with students in residence halls, student unions and libraries. President Webb [W. Roger Webb, president of the University of Central Oklahoma and former commissioner of Public Safety for the State of Oklahoma] suggests that, "Many campuses live with a sense of invincibility. The academic mindset often assumes some sort of moral protective barrier around our campuses."

The AASCU report goes on to say:

> Structures are another prime target for terrorists. Campuses feature large capacity arenas and stadiums that are vulnerable to outdoor threats, performance centers and other venues that attract large crowds who are not easily scrutinized, high rise buildings like residence halls and office buildings that may have parking garages under them. Some institutions house chemical and biological, medical, and animal research laboratories that accommodate toxic and hazardous agents. All campuses have tempting targets such as power plants and heating and cooling terminals, and elaborate information technology systems that are easily accessible and vulnerable.

Previous Incidents

The following list of incidents, which occurred at post-secondary educational institutions, illustrates some of the vulnerabilities.

- On August 24, 1970, anti-Vietnam War activists filled a van with readily available explosive chemicals, drove it to a loading dock at the University of Wisconsin-Madison campus, lit a fuse, and called police to warn them. The target was the Army Math Research Center. The bomb exploded, killing a graduate student/physics researcher and injuring four others in the facility and at least one patient in a hospital across the street. The 3:40 a.m. attack was so powerful, it damaged 26 other buildings. Pieces of the stolen van that contained the bomb were found atop an eight-story building three blocks from the blast site. The impact was most evident among faculty at the physics department at Sterling Hall, which occupied the first floor and basement of the building. While research at the Center was virtually uninterrupted, numerous academic projects in the physics department were destroyed. http://www.jsonline.com/news/state/aug00/sterling20081900a.asp and http://www.leemark.com/featuredcontent/sterling/sterling.html]

- Seven people, including five Americans, were killed and more than 80 injured in a bomb blast in a crowded lunchtime cafeteria at Hebrew University in Jerusalem, Israel, July 31, 2002. The bomber apparently managed to walk through the cafeteria, which was packed with students, place the bomb in the back of the room, and leave. The explosive was apparently left in a bag by a member of the Palestinian terrorist group Hamas, marking a change of tactics from using suicide bombers. [http://abcnews.go.com/sections/world/DailyNews/mideast020731_university.html]

- A bomb went off in Yale University's law school building May 21, 2003. The explosion occurred around 4:40 p.m. The building, including a day care facility, was evacuated after the blast. The building had been used for final exams earlier in the day. Though access to law school classrooms was officially limited to those with university key cards, the University Secretary said the building was open all day and anyone could have walked in. No injuries were reported. There were no threats before the incident and there were no claims of responsibility (Figure 13).
[http://www.cnn.com/2003/US/Northeast/
05/21/yale.explosion/ and http://www.yaledailynews.com/article.asp?AID=22881]

- An unemployed white embalmer was sentenced to life in prison for setting off two pipe bombs in 1999 at predominantly black Florida A&M University. No one was injured in either blast. But the bombings, accompanied by racist phone calls, gripped the school in fear for a month at the beginning of the 1999–2000 school year. The first blast went off August 31 in a men's room at an administration building. The second, on September 22, was in a men's room in a classroom building. Neither caused extensive damage.
[http://www.staugustine.com/stories/091600/sta_20000916.015.shtml and
http://www.splcenter.org/intel/intelreport/article.jsp?aid=315]

- Animal rights activists and environment extremists have perpetrated numerous arson attacks and other malicious acts against university research facilities and veterinary schools since the mid-1980s. Among the most significant and destructive incidents was the April 15, 1987, Animal Liberation Front (ALF) arson attack at the University of California, Davis, Animal Diagnostics Laboratory, which destroyed a building and

Figure 13 Damage Caused by Bomb at Yale University Law School

20 vehicles, causing $5.1 million in damage. ALF members also set a $1.2 million fire at Michigan State University's mink research facility on February 28, 1992, and laboratories at the University of Minnesota were vandalized and dozens of research animals stolen on April 5, 1999, by the ALF, wrecking research into Alzheimer's and cancer. The ALF used accelerants to destroy $400,000 worth of property at Michigan State University in an action targeting Monsanto's genetically engineered products on December 31, 1999, and set fire to the University of Washington's Center for Urban Horticulture, causing $5.6 million in damage and wrecking years of research on genetically altered poplar trees and similar projects on May 21, 2001. The ALF also claimed responsibility for a January 29, 2002, $250,000 arson at the University of Minnesota's Microbial and Plant Genomics Research Center, which was under construction, and for the September 23, 2003, break-in at the Inhalation Laboratory of the Louisiana State University School of Veterinary Medicine in Baton Rouge, causing significant damage.
[http://www.splcenter.org/intel/intelreport/article.jsp?sid=29 and http://neworleans.fbi.gov/pressrel/2004/no012604.htm]

- A former law student at the Appalachian School of Law in Grundy, Virginia, killed the school's dean, a law professor, and a student during a campus shooting spree on January 16, 2002. Three other students were injured and hospitalized. Students ended the rampage by confronting and then tackling the gunman.
  [http://wildcat.arizona.edu/papers/95/82/05_2.html]

- An arson fire destroyed some artifacts at Eureka College's Ronald Reagan Museum on September 29, 2003, but it appeared no critically important pieces were lost. The fire was started in a storeroom. [http://www.kentucky.com/mld/charlotte/living/travel/destinations/u_s_regions/south/carolinas/hilton_head/6901888.htm]

- Boxes of United Nations publications waiting to be put on shelves in the document repository of the University of Georgia's Main Library were the target of an arsonist just before 6 p.m. on July 23, 2003, at a cost of approximately $1.5 million in damages. The UN publications had been in boxes stacked just outside a storage room for computer equipment. The fire destroyed the storage room; it also destroyed or heavily charred nearby shelves of books and filing cabinets containing microfiche images of official documents. The fire quickly made its way up through ceiling tiles and spread throughout much of the 3,000-square-foot repository for state, federal, and UN documents. It was contained in the second-floor storage room and quickly extinguished. The paper-fueled blaze sent heavy smoke billowing throughout the nine-story building, causing a degree of smoke damage on each floor (Figure 14).
  [http://www.onlineathens.com/stories/073003/uga_20030730059.shtml]

Figure 14 Arson Fire at University of Georgia Library

STANDARDS AND REGULATIONS

Higher education institution facilities usually must comply with state and local building and fire codes in the jurisdictions in which they are located. Their structures are vulnerable to natural events, such as tornados, hurricanes, and earthquakes, and on accidental or deliberately induced incidents, such as fires. Many university buildings are no different from similar facilities off-campus or from each other. Thus, dormitories have many commonalities with apartment houses and hotels; administrative buildings with commercial office buildings; and classrooms, lecture halls (Figures 15 and 16), and laboratories at one institution with another. Most campus structures are therefore regulated by standard codes.

Figure 15 Traditional University Classroom

Figure 16 Large University Lecture Hall Filled with Students

The International Code Council (ICC) is a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The founders of the ICC were Building Officials and Code Administrators International, Inc., International Conference of Building Officials, and Southern Building Code Congress International, Inc. These nonprofit organizations had developed three separate sets of model codes used throughout the United States. In 1994, these groups combined to form the ICC and develop a single set of codes without regional limitations. The ICC publishes a variety of references to building codes and standards, including the International Building Code and state and local codes. It offers technical publications that cover most topics associated with building structures. It also performs technical evaluations of building plans and provides technical support to its members. The ICC home page [http://www.iccsafe.org/] provides links to the organization's publications and services.

In addition to the model codes, various jurisdictions, cities, and states amend the models or write their own codes to suit their own particular conditions. The National Conference of States on Building Codes and Standards was founded by the nation's governors in 1967 to promote the development of an efficient, cooperative system of building regulations to assure the health, safety, and welfare of the public within the built environment [http://www.ncsbcs.org/].

The Federal Emergency Management Agency (FEMA) has published a series of risk management manuals and primers to help develop and enhance building terrorism resistance methodologies. According to FEMA, the *Reference Manual to Mitigate Potential Terrorist Attacks against Buildings* "provides guidance to the building science community of architects and engineers, to reduce physical damage to buildings, related infrastructure, and people caused by terrorist assaults. The manual presents incremental approaches that can be implemented over time to decrease the vulnerability of buildings to terrorist threats. Many of the recommendations

can be implemented quickly and cost-effectively." FEMA states that the *Primer for Design of Commercial Buildings to Mitigate Terrorist Attacks* "introduces a series of concepts that can help building designers, owners, and state and local governments mitigate the threat of hazards resulting from terrorist attacks on new buildings." These relatively new publications are available online at [http://www.fema.gov/fima/rmsp426.shtm].

The United Kingdom's Home Office has produced a detailed publication entitled, *Bombs: Protecting People and Property — A Handbook for Managers*. It was, according to its preface, "written specifically with managers in mind. The advice which it contains is relevant to all businesses and organizations…. The handbook is, of necessity, written with a wide audience in mind. It does not – cannot – address the particular circumstances of each reader." The fourth and latest edition of the handbook is available online in two parts [http://www.homeoffice.gov.uk/docs/bombs.pdf and http://www.homeoffice.gov.uk/docs/bombs2.pdf].

The Centers for Disease Control and Prevention, in conjunction with the National Institute for Occupational Safety and Health, issued a comprehensive report entitled, *CDC-NIOSH Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks*, which details preventive steps that can be taken to reduce the likelihood and mitigate the impact of threats and potential hazards associated with chemical, biological, or radiological terrorism. Although this document discusses buildings in general, many of the vulnerabilities and recommendations are applicable. The entire document is online at [http://www.cdc.gov/niosh/bldvent/pdfs/2002-139.pdf].

Many vulnerability studies with suggested remedies have been published that deal with potential incidents, not terrorism-related, but with similar scenarios and consequences. Vulnerability to a fire and mitigation of the effects is one example. There are obvious differences in preventive measures; however, once a fire occurs (regardless of whether the cause was a gas line leak, faulty wiring, or arson attack), facility vulnerabilities are the same. The same is true of safety measures such as sprinkler systems and fire doors. The National Fire Protection Association (NFPA) has produced many publications and reports relating to fire prevention, including codes and standards, preventive measures, and alarm and signaling systems. Links to these documents can be found at the NFPA Web site [http://www.nfpa.org/catalog/home/index.asp].

CONSEQUENCE OF EVENT

The consequences of a successful attack on post-secondary educational facility can be wide-ranging. The impact would depend on what type of institution (university, community college, vocational/trade school, etc.) and what facility(ies) (dormitory, laboratory, classroom/lecture hall administrative building or a combination) were attacked. Consequences are discussed in the following sections.

Public Health and Safety Consequences

A terrorist attack against an institution of higher education could inflict a large number of casualties, particularly if aimed at locations crowded with people (e.g., lecture halls, cafeterias,

dormitories). A bombing or the release of a biological, chemical, or radiological agent could create immediate casualties. A stampede toward the exits could add to the initial casualties. In the past, stampedes by crowds in buildings have killed and injured scores of people, sometimes more than the precipitating event. Structural collapse could result from some types of attacks and add to the casualty list.

In addition to the immediate effects of an attack on a public institution, there would be impacts on local, and perhaps regional, emergency service and public health resources. Emergency response plans may need to be initiated. A large number of fire and rescue, hazardous material, law enforcement, and medical personnel, facilities, and equipment may need to be activated. Depending on its severity, an incident may tax available resources. This situation is not unlike the effects of a natural or accidental event, such as an earthquake, tornado, hurricane, or fire.

If a research laboratory or other facility containing hazardous chemicals, biological agents, or radiological material was damaged or destroyed and contaminants were released, the impact would affect an even greater area. In the case of infectious biological agents, dispersion through contaminated persons or release into the environment could affect the entire country. Chemical and radiological material could also be dispersed over a large area if there were a large explosion under adverse meteorological conditions.

Economic Consequences

Significant economic impacts would occur locally and perhaps regionally if a major higher education institution were destroyed or incapacitated. Jobs would be lost. Insurance companies and/or municipalities would be affected. A number of communities, so-called "college towns" are economically dependent on their schools, and an attack could have a significant impact on the local economy.

Social and Institutional Consequences

People go to higher education institutions for a variety of reasons. They go to acquire knowledge and information for academic and other educational and professional purposes and for self-fulfillment and advancement. A significant and widespread effect of an attack on an educational institution would be psychological. The sense that these institutions are not in a dangerous environment would be lost. Over a longer term, students could be impeded in their academic studies.

For many people, university and college facilities and activities provide an important social outlet. Attendance at sporting events, concerts, lectures, art shows, and other events held at higher education institution campuses involves members of the academic community and millions of other Americans. A major terrorist attack could deprive many people of participation in these activities.

National Security Consequences

A successful terrorist attack on a major higher education institution could have significant national security consequences. As part of their research activities, these institutions serve as repositories for information and knowledge critical to advancing the nation's technological expertise; provide background for understanding the adversaries we face; and are important in the training of current and future leaders. There would be national security consequences if research conducted at these institutions were destroyed or degraded. What those consequences were would depend upon what facility at what institution was targeted.

Other Consequences

Higher education institutions serve as focal points for academic conferences and research. A successful attack could impede the exchange of information in a multitude of academic disciplines.

GENERAL VULNERABILITIES

Critical infrastructures and key assets vary in many characteristics and practices relevant to specifying vulnerabilities. There is no universal list of vulnerabilities that applies to all assets of a particular type within an infrastructure category. In addition to the key vulnerabilities that apply to post-secondary educational institutions that have been discussed in a previous section, a list of general vulnerabilities has been prepared, based on experience and observation over a range of infrastructures. These general vulnerabilities should be interpreted as possible vulnerabilities and not as applying to each individual facility or asset. Many facilities have instituted security vulnerability assessment protocols, site prioritization processes, and risk-based approaches for improving security performance, including provisions to increase security measures during heightened threat conditions. The security improvements implemented by facility owners under such protocols may mitigate certain vulnerabilities listed below. The vulnerabilities listing considers the issues within the physical perimeter boundaries of the facilities.

Exhibit 1 Economic and Institutional Vulnerabilities
Economic and institutional vulnerabilities are those that would have extensive national, regional, or industry-wide consequences if exploited by a terrorist attack.
1   An attack on a higher education institution could affect consumer-spending profiles and have a ripple effect throughout other parts of the economy.
2   Local economies would be affected most by an attack.
3   School-related jobs could be significantly impacted by an attack.

Exhibit 2 Site-Related Vulnerabilities

Site-related vulnerabilities are conditions or situations existing at a particular site or facility that could be exploited by a terrorist or terrorist group to do economic, physical, or bodily harm or to disable or disrupt facility operations or other critical infrastructures.

Access and Access Control

1	Schools encourage individuals to come to the facility by creating an open, friendly structure. Large numbers of people enter and exit each day.
2	People carry packages of all shapes and sizes into and out of campus facilities each day.
3	Schools have numerous entrances and exits for students, faculty, employees, and deliveries. Many companies make deliveries to the campus.
4	Public roads and/or mass transit must be in close proximity to a school allowing easy access.
5	Most schools have large parking areas with many vehicles coming and going all day. Parking areas are close to the facility to allow easy access. In some cases, parking garages are contiguous to the structure or incorporated into it.
6	Loading docks and other areas for delivery are usually contiguous to the structures or incorporated into it.
7	Vehicles stop to let passengers disembark in front of entrances. There are few if any physical barriers between parking areas/roadways and ground-level entrances/exits.
8	Contractors may service school infrastructure (e.g., HVAC and other systems).

Operational Security

9	The number of security personnel is based on property-related crimes, such as shoplifting, and vandalism and theft, and on protection of students, faculty, and visitors from assault, robbery, carjacking, rape, and other crimes.
10	Security personnel are trained to monitor the facility for property-related crimes and crimes against individuals.
11	The placement and use of surveillance cameras for parking areas and inside common areas may not cover all locations.
12	Background checks on people working at the institution may be limited.

Emergency Planning and Preparedness

13	A major attack on a campus may stress the available emergency response resources.
14	Emergency planning at a campus is usually geared toward fires and natural disasters and may not be practiced routinely.

Exhibit 3 Interdependent Vulnerabilities

Interdependency is the relationship between two or more infrastructures by which the condition or functionality of each infrastructure is affected by the condition or functionality of the other(s). Interdependencies can be physical, geographic, logical, or information-based.

General

1	On campuses, emergency and backup systems may be located in the same central core as the primary utilities, making both vulnerable to the same structural damage.
2	Disruption of any or all utilities could disrupt operation of services.

Natural Gas

3	Natural gas service to the campus could be interrupted, causing loss of heating capability.
4	Tampering with the natural gas supply system could occur, thereby creating fires or explosions.

Water

5	Tampering with the water supply systems could occur, thereby inhibiting fire-fighting capability.
6	Drinking water supplies could be contaminated.

Electric Power

7	Electric power service could be disrupted.

USEFUL REFERENCE MATERIAL AND WEB SITES

1. The White House, *National Strategy for the Physical Protection of Critical Infrastructures and Key Assets*, Feb. 2003 [http://www.whitehouse.gov/pcipb/physical.html].

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